

What is claimed is:

1. In a computer network having a plurality of nodes for interacting with computer network information, a system for managing said plurality of nodes comprising:

means for establishing a DDB in each of said nodes; and,

means for controlling contents of each said DDB to be substantially identical to contents of every other said DDB and in a manner to avoid a single point of failure.

2. The system of claim 1 and wherein:

said computer network information comprises both computer data and domain configuration status, and said each of said nodes has a unique IP address; and,

said DDB establishing means further comprises:

means for associating each said unique IP address with its respective node

to provide an IP-address-respective-node association;

means for combining said association for said each of said nodes into a

network IP association; and,

means for distributing said network IP association to said DDB in each of

said nodes; and,

said contents controlling means further comprises:

means for maintaining the most current of said domain configuration

status in said DDB in each of said nodes.

1 3. The system of claim 1 and wherein said interacting includes receiving, storing,
2 modifying, and transmitting.

3
4 4. The system of claim 2 and wherein said controlling means further comprises:
5 means for selecting one of said plurality of nodes as a master node;
6 means for subordinating all other of said plurality of nodes to said master node in
7 a configuration defined by said master node and said all other of said plurality of nodes;
8 and,
9 said master node including means for responding to a change to said domain
10 configuration status in a manner to maintain said contents of each said DDB substantially
11 identical to said contents of every other DDB.

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13 5. The system of claim 4 and wherein said controlling means further comprises:
14 means for replacing said master node with another node if said master node fails.

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16 6. The system of claim 5 and wherein said master node replacing means includes
17 means for replacing said master node with another node selected from said configuration.

18
19 7. The system of claim 4 and wherein said change to said domain configuration
20 status is selected from the group of changes consisting of: adding a first node to said
21 configuration; deleting a second node from said configuration; a third node failing in said
22 configuration; and, a network link failing between a fourth node in said configuration and
23 said master node.

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2 8. The system of claim 7 and wherein said computer network is a client-server
3 network having a graphical user interface and wherein said selecting means further
4 comprises:

5 means, utilizing said graphical user interface, for invoking a select master dialog
6 by which said user can select said one of said plurality of nodes.
7

8 9. The system of claim 5 and wherein said computer network is a client-server
9 network having a graphical user interface and wherein said replacing means further
10 comprises:

11 means, utilizing said graphical user interface, for invoking a select master dialog
12 by which said user can select said another node.
13

14 10. The system of claim 7 and wherein said responding means further comprises:

15 first means for handling said third node failing under conditions in which said
16 master node is known to said third node; and,

17 second means for handling said third node failing under conditions in which said
18 master node is unknown to said third node.
19

20 11. The system of claim 10 and wherein said first means further comprises:

21 means for establishing version numbers to identify versions of said DDB in each
22 of said plurality of nodes;

1 means, employed by each of said all other of said plurality of nodes, for
2 continuously polling said master node at regular intervals to obtain the most current one
3 of said version numbers of the DDB in said master node;
4 means employed by said master node, responsive to said polling received from
5 said third node after recovery of said third node, for sending said most current one of said
6 version numbers to said third node; and
7 means for updating the DDB in said third node if said most current one of said
8 version numbers does not match the version number of said DDB in said third node.

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10 12. The system of claim 11 and wherein said third node DDB updating means
11 includes means for handshaking between said master node and said third node.

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13 13. The system of claim 10 and wherein said conditions in which said master node is
14 unknown to said third node include both said third node failing while it is being added to
15 said configuration and said master node was replaced during time of failure of said third
16 node.

17
18 14. The system of claim 13 and wherein said second means further comprises:
19 means, employed by said master node, for repetitively pinging said third node at
20 predetermined intervals until said third node recovers and sends a recovery signal to said
21 master node; and,
22 said master node including means, responsive to said recovery signal, for
23 updating the DDB in said third node as may be needed.

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2 15. The system of claim 14 and wherein said third node DDB updating means
3 includes means for handshaking between said master node and said third node.
4

5 16. The system of claim 7 and wherein said responding means further comprises:
6 means for handling said network link failing.
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8 17. The system of claim 16 and wherein said network link failing handling means
9 further comprises:

10 means for establishing version numbers to identify versions of said DDB in each
11 of said plurality of nodes;

12 means, employed by each of said all other of said plurality of nodes, for
13 continuously polling said master node at regular intervals to obtain the most current one
14 of said version numbers of the DDB in said master node;

15 means employed by said master node, responsive to said polling received from
16 said fourth node after recovery of said network link, for sending said most current one of
17 said version numbers to said fourth node; and,

18 means for updating the DDB in said fourth node if said most current one of said
19 version numbers does not match the version number of said DDB in said fourth node.
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21 18. The system of claim 17 and wherein said fourth node DDB updating means
22 includes means for handshaking between said master node and said fourth node.
23

19. The system of claim 7 and wherein said responding means further comprises:
means for handling said adding a first node to said configuration.

20. The system of claim 19 and wherein said first node adding handling means
comprises:

means for determining if said first node is being added through said master node
to obtain a master-added node or through one of said all other of said plurality of nodes to
obtain a portal-added node.

21. The system of claim 20 and wherein said determining means, for the condition of
said master-added node, further comprises:

said master node including means for updating the DDB in said master node with
the IP address of said first node and for informing said first node that the first node's
master is said master node;

said first node including means, responsive to operation of said informing means,
for entering the IP address of said master node in the DDB of said first node and for
acknowledging said master node; and,

said master node including means for sending said IP address of said first node as
an update to all other nodes in said configuration.

22. The system of claim 21 and wherein said IP address sending means further
comprises:

1 means for performing a master to node handshake between said master node and
2 said all other nodes in said configuration.

3
4 23. The system of claim 20 and wherein said determining means, for the condition of
5 said portal-added node, further comprises:

6 a cache memory included in said portal node;

7 means for holding the IP address of said first node in said cache memory;

8 means for performing a node to master handshake between said first node and
9 said master node;

10 said portal node including means for informing said master node of the IP address
11 of said first node;

12 said master node including means for updating the DDB in said master node with
13 the IP address of said first node and for informing said first node that the first node's
14 master is said master node;

15 said first node including means, responsive to operation of said informing means,
16 for entering the IP address of said master node in the DDB of said first node and for
17 acknowledging said master node; and,

18 said master node including means for sending said IP address of said first node as
19 an update to all other nodes in said configuration.

20
21 24. The system of claim 23 and wherein said IP address sending means further
22 comprises:

means for performing a master to node handshake between said master node and said all other nodes in said configuration.

25. The system of claim 8 and wherein said responding means further comprises: means for handling said deleting a second node from said plurality of nodes.

26. The system of claim 25 and wherein said second node deleting handling means further comprises:

means, utilizing said graphical user interface, for removing said second node from said configuration;

means for determining if said second node is removed through said master node; means, responsive to operation of said determining means removing said second node through said master node, for:

(1) updating the DDB in said master node by removing the IP address of said second node from the DDB of said master node;

(2) informing said second node that said configuration no longer includes said second node and detaching said second node from said configuration;

(3) erasing all contents of the DDB of said second node; and,

(4) sending an update to all remaining nodes in said configuration.

27. The system of claim 26 and wherein said update sending means further comprises:

1 means for performing a master to node handshake between said master node and
2 said all remaining nodes in said configuration.

3
4 28. The system of claim 25 and wherein said second node deleting handling means
5 further comprises:

6 means, utilizing said graphical user interface, for removing said second node from
7 said configuration;

8 means for selecting a portal-removal node other than said master node through
9 which to remove said second node from said configuration;

10 a cache memory included in said portal-removal node;

11 means for determining if said second node is removed through said master node;

12 means, responsive to operation of said determining means removing said second
13 node through said portal-removal node and not through said master node, for:

14 (1) storing the IP address of said second node in said cache;

15 (2) performing a node to master handshake between said portal-removal
16 node and said master node;

17 (3) informing said master node to remove the IP address of said second
18 node from the DDB of said master node;

19 (4) updating the DDB in said master node by removing the IP address of
20 said second node from the DDB of said master node;

21 (5) informing said second node that said configuration no longer includes
22 said second node and detaching said second node from said configuration;

23 (6) erasing all contents of the DDB of said second node; and,

1 (7) sending an update to all remaining nodes in said configuration.

2
3 29. The system of claim 28 and wherein said update sending means further
4 comprises:

5 means for performing a master to node handshake between said master node and
6 said all remaining nodes in said configuration.

7
8 30. The system of claim 22 or 24 and wherein said master to node handshake
9 performing means comprises for each one of said all other nodes in said configuration:

10 first deciding means for deciding if the IP address of said master node in said
11 update matches the IP address of said master node contained in the DDB of said each one
12 of said all other nodes in said configuration;

13 means, responsive to operation of said first deciding means deciding no match, for
14 rejecting said update and logging said event;

15 second deciding means, responsive to operation of said first deciding means
16 deciding a match, for deciding if the version number of the DDB in said master node
17 before said update matches the version number of said DDB of said each one of said all
18 other nodes in said configuration before said update;

19 means, responsive to operation of said second deciding means deciding no match,
20 for accepting a completely updated DDB with updated version number from said master
21 node; and,

22 means, responsive to operation of said second deciding means deciding a match,
23 for accepting only said update with said updated version number from said master node.

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2 31. The system of claim 27 or 29 and wherein said master to node handshake
3 performing means comprises for each one of said all remaining nodes in said
4 configuration:

5 first deciding means for deciding if the IP address of said master node in said
6 update matches the IP address of said master node contained in the DDB of said each one
7 of said all remaining nodes in said configuration;

8 means, responsive to operation of said first deciding means deciding no match, for
9 rejecting said update and logging said event;

10 second deciding means, responsive to operation of said first deciding means
11 deciding a match, for deciding if the version number of the DDB in said master node
12 before said update matches the version number of said DDB of said each one of said all
13 remaining nodes in said configuration;

14 means, responsive to operation of said second deciding means deciding no match,
15 for accepting a completely updated DDB with updated version number from said master
16 node; and,

17 means, responsive to operation of said second deciding means deciding a match,
18 for accepting only said update with said updated version number from said master node.
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21 32. A computer program product for use in a computer network having a plurality of
22 nodes for interacting with computer network information, said computer program product

1 including a computer usable medium having computer readable program code thereon for
2 managing said plurality of nodes, said program code comprising:
3 program code for establishing a DDB in each of said nodes; and,
4 program code for controlling contents of each said DDB to be substantially
5 identical to contents of every other said DDB and in manner to avoid a single point of
6 failure.

7
8 33. The computer program product of claim 32 and wherein:

9 said computer network information comprises both computer data and domain
10 configuration status, and said each of said nodes has a unique IP address; and,

11 said DDB establishing program code further comprises:

12 program code for associating each said unique IP address with its

13 respective node to provide an IP-address-respective-node association;

14 program code for combining said association for said each of said nodes
15 into a network IP association; and,

16 program code for distributing said network IP association to said DDB in
17 each of said nodes; and,

18 said contents controlling program code further comprises:

19 program code for maintaining the most current of said domain

20 configuration status in said DDB in each of said nodes.

21
22 34. The computer program product of claim 32 and wherein said interacting includes
23 receiving, storing, modifying, and transmitting.

1
2 35. The computer program product of claim 33 and wherein said controlling program
3 code further comprises:

4 program code for selecting one of said plurality of nodes as a master node;

5 program code for subordinating all other of said plurality of nodes to said master
6 node in a configuration defined by said master node and said all other of said plurality of
7 nodes; and,

8 said master node including program code for responding to a change to said
9 domain configuration status in a manner to maintain said contents of each said DDB
10 substantially identical to said contents of every other DDB.

11
12 36. The computer program product of claim 35 and wherein said controlling program
13 code further comprises:

14 program code for replacing said master node with another node if said master
15 node fails.

16
17 37. The computer program product of claim 36 and wherein said master node
18 replacing program code includes program code for replacing said master node with
19 another node selected from said configuration.

20
21 38. The computer program product of claim 35 and wherein said change to said
22 domain configuration status is selected from the group of changes consisting of: adding a
23 first node to said configuration; deleting a second node from said configuration; a third

1 node failing in said configuration; and, a network link failing between a fourth node in
2 said configuration and said master node.

3
4 39. The computer program product of claim 38 and wherein said computer network is
5 a client-server network having a graphical user interface and wherein said selecting
6 program code further comprises:

7 program code, utilizing said graphical user interface, for invoking a select master
8 dialog by which said user can select said one of said plurality of nodes.

9
10 40. The computer program product of claim 36 and wherein said computer network is
11 a client-server network having a graphical user interface and wherein said replacing
12 program code further comprises:

13 program code, utilizing said graphical user interface, for invoking a select master
14 dialog by which said user can select said another node.

15
16 41. The computer program product of claim 38 and wherein said responding program
17 code further comprises:

18 first program code for handling said third node failing under conditions in which
19 said master node is known to said third node; and,

20 second program code for handling said third node failing under conditions in
21 which said master node is unknown to said third node.

1 42. The computer program product of claim 41 and wherein said first program code
2 further comprises:

3 program code for establishing version numbers to identify versions of said DDB
4 in each of said plurality of nodes;

5 program code, employed by each of said all other of said plurality of nodes, for
6 continuously polling said master node at regular intervals to obtain the most current one
7 of said version numbers of the DDB in said master node;

8 program code employed by said master node, responsive to said polling received
9 from said third node after recovery of said third node, for sending said most current one
10 of said version numbers to said third node; and

11 program code for updating the DDB in said third node if said most current one of
12 said version numbers does not match the version number of said DDB in said third node.
13

14 43. The computer program product of claim 42 and wherein said third node DDB
15 updating program code includes program code for handshaking between said master node
16 and said third node.
17

18 44. The computer program product of claim 41 and wherein said conditions in which
19 said master node is unknown to said third node include both said third node failing while
20 it is being added to said configuration and said master node was replaced during time of
21 failure of said third node.
22

1 45. The computer program product of claim 44 and wherein said second program
2 code further comprises:

3 program code, employed by said master node, for repetitively pinging said third
4 node at predetermined intervals until said third node recovers and sends a recovery signal
5 to said master node; and,

6 said master node including program code, responsive to said recovery signal, for
7 updating the DDB in said third node as may be needed.

8
9 46. The computer program product of claim 45 and wherein said third node DDB
10 updating program code includes program code for handshaking between said master node
11 and said third node.

12
13 47. The computer program product of claim 38 and wherein said responding program
14 code further comprises:

15 program code for handling said network link failing.

16
17 48. The computer program product of claim 47 and wherein said network link failing
18 handling program code further comprises:

19 program code for establishing version numbers to identify versions of said DDB
20 in each of said plurality of nodes;

21 program code, employed by each of said all other of said plurality of nodes, for
22 continuously polling said master node at regular intervals to obtain the most current one
23 of said version numbers of the DDB in said master node;

1 program code employed by said master node, responsive to said polling received
2 from said fourth node after recovery of said network link, for sending said most current
3 one of said version numbers to said fourth node; and,

4 program code for updating the DDB in said fourth node if said most current one
5 of said version numbers does not match the version number of said DDB in said fourth
6 node.

7
8 49. The computer program product of claim 48 and wherein said fourth node DDB
9 updating program code includes program code for handshaking between said master node
10 and said fourth node.

11
12 50. The computer program product of claim 38 and wherein said responding program
13 code further comprises:

14 program code for handling said adding a first node to said configuration.

15
16 51. The computer program product of claim 50 and wherein said first node adding
17 handling program code comprises:

18 program code for determining if said first node is being added through said master
19 node to obtain a master-added node or through one of said all other of said plurality of
20 nodes to obtain a portal-added node.

21
22 52. The computer program product of claim 51 and wherein said determining
23 program code, for the condition of said master-added node, further comprises:

1 said master node including program code for updating the DDB in said master
2 node with the IP address of said first node and for informing said first node that the first
3 node's master is said master node;

4 said first node including program code, responsive to operation of said informing
5 program code, for entering the IP address of said master node in the DDB of said first
6 node and for acknowledging said master node; and,

7 said master node including program code for sending said IP address of said first
8 node as an update to all other nodes in said configuration.

9
10 53. The computer program product of claim 52 and wherein said IP address sending
11 program code further comprises:

12 program code for performing a master to node handshake between said master
13 node and said all other nodes in said configuration.

14
15 54. The computer program product of claim 51 and wherein said determining
16 program code, for the condition of said portal-added node, further comprises:

17 a cache memory included in said portal node;

18 program code for holding the IP address of said first node in said cache memory;

19 program code for performing a node to master handshake between said first node
20 and said master node;

21 said portal node including program code for informing said master node of the IP
22 address of said first node;

1 said master node including program code for updating the DDB in said master
2 node with the IP address of said first node and for informing said first node that the first
3 node's master is said master node;

4 said first node including program code, responsive to operation of said informing
5 program code, for entering the IP address of said master node in the DDB of said first
6 node and for acknowledging said master node; and,

7 said master node including program code for sending said IP address of said first
8 node as an update to all other nodes in said configuration.

9
10 55. The computer program product of claim 54 and wherein said IP address sending
11 program code further comprises:

12 program code for performing a master to node handshake between said master
13 node and said all other nodes in said configuration.

14
15 56. The computer program product of claim 39 and wherein said responding program
16 code further comprises:

17 program code for handling said deleting a second node from said plurality of
18 nodes.

19
20 57. The computer program product of claim 56 and wherein said second node
21 deleting handling program code further comprises:

22 program code, utilizing said graphical user interface, for removing said second
23 node from said configuration;

1 program code for determining if said second node is removed through said master
2 node;

3 program code, responsive to operation of said determining program code
4 removing said second node through said master node, for:

5 (1) updating the DDB in said master node by removing the IP address of
6 said second node from the DDB of said master node;

7 (2) informing said second node that said configuration no longer includes
8 said second node and detaching said second node from said configuration;

9 (3) erasing all contents of the DDB of said second node; and,

10 (4) sending an update to all remaining nodes in said configuration.
11

12 58. The computer program product of claim 57 and wherein said update sending
13 program code further comprises:

14 program code for performing a master to node handshake between said master
15 node and said all remaining nodes in said configuration.
16

17 59. The computer program product of claim 56 and wherein said second node
18 deleting handling program code further comprises:

19 program code, utilizing said graphical user interface, for removing said second
20 node from said configuration;

21 program code for selecting a portal-removal node other than said master node
22 through which to remove said second node from said configuration;

23 a cache memory included in said portal-removal node;

1 program code for determining if said second node is removed through said master
2 node;

3 program code, responsive to operation of said determining program code
4 removing said second node through said portal-removal node and not through said master
5 node, for:

6 (1) storing the IP address of said second node in said cache;

7 (2) performing a node to master handshake between said portal-removal
8 node and said master node;

9 (3) informing said master node to remove the IP address of said second
10 node from the DDB of said master node;

11 (4) updating the DDB in said master node by removing the IP address of
12 said second node from the DDB of said master node;

13 (5) informing said second node that said configuration no longer includes
14 said second node and detaching said second node from said configuration;

15 (6) erasing all contents of the DDB of said second node; and,

16 (7) sending an update to all remaining nodes in said configuration.

17
18 60. The computer program product of claim 59 and wherein said update sending
19 program code further comprises:

20 program code for performing a master to node handshake between said master
21 node and said all remaining nodes in said configuration.

22

61. The computer program product of claim 53 or 55 and wherein said master to node handshake performing program code comprises for each one of said all other nodes in said configuration:

first deciding program code for deciding if the IP address of said master node in said update matches the IP address of said master node contained in the DDB of said each one of said all other nodes in said configuration;

program code, responsive to operation of said first deciding program code deciding no match, for rejecting said update and logging said event;

second deciding program code, responsive to operation of said first deciding program code deciding a match, for deciding if the version number of the DDB in said master node before said update matches the version number of said DDB of said each one of said all other nodes in said configuration before said update;

program code, responsive to operation of said second deciding program code deciding no match, for accepting a completely updated DDB with updated version number from said master node; and,

program code, responsive to operation of said second deciding program code deciding a match, for accepting only said update with said updated version number from said master node.

62. The computer program product of claim 58 or 60 and wherein said master to node handshake performing program code comprises for each one of said all remaining nodes in said configuration:

1 first deciding program code for deciding if the IP address of said master node in
2 said update matches the IP address of said master node contained in the DDB of said each
3 one of said all remaining nodes in said configuration;

4 program code, responsive to operation of said first deciding program code
5 deciding no match, for rejecting said update and logging said event;

6 second deciding program code, responsive to operation of said first deciding
7 program code deciding a match, for deciding if the version number of the DDB in said
8 master node before said update matches the version number of said DDB of said each one
9 of said all remaining nodes in said configuration;

10 program code, responsive to operation of said second deciding program code
11 deciding no match, for accepting a completely updated DDB with updated version
12 number from said master node; and,

13 program code, responsive to operation of said second deciding program code
14 deciding a match, for accepting only said update with said updated version number from
15 said master node.

16
17 63. In a computer network having a plurality of nodes for interacting with computer
18 network information, a method for managing said plurality of nodes comprising:

19 establishing a DDB in each of said nodes; and,

20 controlling contents of each said DDB to be substantially identical to contents of
21 every other said DDB and in a manner to avoid a single point of failure.

22
23 64. The method of claim 63 and wherein:

1 said computer network information comprises both computer data and domain
2 configuration status, and said each of said nodes has a unique IP address; and,
3 said DDB establishing further comprises:
4 associating each said unique IP address with its respective node to provide
5 an IP-address-respective-node association;
6 combining said association for said each of said nodes into a network IP
7 association; and,
8 distributing said network IP association to said DDB in each of said nodes;
9 and,
10 said contents controlling further comprises:
11 maintaining the most current said domain configuration status in said
12 DDB in each of said nodes.

13
14 65. The method of claim 63 and wherein said interacting includes receiving, storing,
15 modifying, and transmitting.

16
17 66. The method of claim 64 and wherein said controlling further comprises:
18 selecting one of said plurality of nodes as a master node;
19 subordinating all other of said plurality of nodes to said master node in a
20 configuration defined by said master node and said all other of said plurality of nodes;
21 and,

1 responding to a change to said domain configuration status in a manner to
2 maintain said contents of each said DDB substantially identical to said contents of every
3 other DDB.

4
5 67. The method of claim 66 and wherein said controlling further comprises:
6 replacing said master node with another node if said master node fails.

7
8 68. The method of claim 67 and wherein said master node replacing includes
9 replacing said master node with another node selected from said configuration.

10
11 69. The method of claim 66 and wherein said change to said domain configuration
12 status is selected from the group of changes consisting of: adding a first node to said
13 configuration; deleting a second node from said configuration; a third node failing in said
14 configuration; and, a network link failing between a fourth node in said configuration and
15 said master node.

16
17 70. The method of claim 69 and wherein said computer network is a client-server
18 network having a graphical user interface and wherein said selecting further comprises:
19 utilizing said graphical user interface to invoke a select master dialog by which
20 said user can select said one of said plurality of nodes.

21
22 71. The method of claim 67 and wherein said computer network is a client-server
23 network having a graphical user interface and wherein said replacing further comprises:

utilizing said graphical user interface to invoke a select master dialog by which said user can select said another node.

72. The method of claim 69 and wherein said responding further comprises:
first handling said third node failing under conditions in which said master node is known to said third node; and,
second handling said third node failing under conditions in which said master node is unknown to said third node.

73. The method of claim 72 and wherein said first handling further comprises:
establishing version numbers to identify versions of said DDB in each of said plurality of nodes;
each of said all other of said plurality of nodes continuously polling said master node at regular intervals to obtain the most current one of said version numbers of the DDB in said master node;
said master node, responsive to said polling received from said third node after recovery of said third node, sending said most current one of said version numbers to said third node; and
updating the DDB in said third node if said most current one of said version numbers does not match the version number of said DDB in said third node.

74. The method of claim 73 and wherein said third node DDB updating includes handshaking between said master node and said third node.

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2 75. The method of claim 72 and wherein said conditions under which said master
3 node is unknown to said third node include both said third node failing while being added
4 to said configuration and said master node being replaced during time of failure of said
5 third node.

6
7 76. The method of claim 75 and wherein said second handling further comprises:
8 said master node repetitively pinging said third node at predetermined intervals
9 until said third node recovers and sends a recovery signal to said master node; and,
10 said master node, responsive to said recovery signal, updating the DDB in said
11 third node as may be needed.

12
13 77. The method of claim 76 and wherein said third node DDB updating includes
14 handshaking between said master node and said third node.

15
16 78. The method of claim 69 and wherein said responding further comprises:
17 handling said network link failing.

18
19 79. The method of claim 78 and wherein said network link failing handling further
20 comprises:
21 establishing version numbers to identify versions of said DDB in each of said
22 plurality of nodes;

each of said all other of said plurality of nodes continuously polling said master node at regular intervals to obtain the most current one of said version numbers of the DDB in said master node;

said master node, responsive to said polling received from said fourth node after recovery of said network link, sending said most current one of said version numbers to said fourth node; and,

updating the DDB in said fourth node if said most current one of said version numbers does not match the version number of said DDB in said fourth node.

80. The method of claim 79 and wherein said fourth node DDB updating includes handshaking between said master node and said fourth node.

81. The method of claim 69 and wherein said responding further comprises: handling said adding a first node to said configuration.

82. The method of claim 81 and wherein said first node adding handling comprises: determining if said first node is being added through said master node to obtain a master-added node or through one of said all other of said plurality of nodes to obtain a portal-added node.

83. The method of claim 82 and wherein said determining, for the condition of said master-added node, further comprises:

1 said master node updating the DDB in said master node with the IP address of
2 said first node and informing said first node that the first node's master is said master
3 node;

4 said first node, responsive to said informing, entering the IP address of said
5 master node in the DDB of said first node and acknowledging said master node; and,

6 said master node sending said IP address of said first node as an update to all
7 other nodes in said configuration.

8
9 84. The method of claim 83 and wherein said IP address sending further comprises:
10 performing a master to node handshake between said master node and said all
11 other nodes in said configuration.

12
13 85. The method of claim 82 for the condition of said portal-added node, and wherein
14 said portal-added node includes a cache memory, said determining further comprising:

15 holding the IP address of said first node in said cache memory;
16 performing a node to master handshake between said first node and said master
17 node;

18 said portal node informing said master node of the IP address of said first node;

19 said master node updating the DDB in said master node with the IP address of
20 said first node and informing said first node that the first node's master is said master
21 node;

22 said first node, responsive to said informing, entering the IP address of said
23 master node in the DDB of said first node and acknowledging said master node; and,

1 said master node sending said IP address of said first node as an update to all
2 other nodes in said configuration.

3
4 86. The method of claim 85 and wherein said IP address sending further comprises:
5 performing a master to node handshake between said master node and said all
6 other nodes in said configuration.

7
8 87. The method of claim 70 and wherein said responding further comprises:
9 handling said deleting a second node from said plurality of nodes.

10
11 88. The method of claim 87 and wherein said second node deleting handling further
12 comprises:
13 utilizing said graphical user interface to remove said second node from said
14 configuration;
15 determining if said second node is removed through said master node;
16 said determining, responsive to said utilizing removing said second node through
17 said master node, for:

18 (1) updating the DDB in said master node by removing the IP address of
19 said second node from the DDB of said master node;

20 (2) informing said second node that said configuration no longer includes
21 said second node and detaching said second node from said configuration;

22 (3) erasing all contents of the DDB of said second node; and,

23 (4) sending an update to all remaining nodes in said configuration.

1
2 89. The method of claim 88 and wherein said update sending further comprises:

3 performing a master to node handshake between said master node and said all
4 remaining nodes in said configuration.

5
6 90. The method of claim 87 and wherein said second node deleting handling further
7 comprises:

8 utilizing said graphical user interface to remove said second node from said
9 configuration;

10 selecting a portal-removal node other than said master node through which to
11 remove said second node from said configuration;

12 establishing a cache memory in said portal-removal node;

13 determining if said second node is removed through said master node;

14 said determining, responsive to said utilizing removing said second node through
15 said portal-removal node and not through said master node:

16 (1) storing the IP address of said second node in said cache;

17 (2) performing a node to master handshake between said portal-removal
18 node and said master node;

19 (3) informing said master node to remove the IP address of said second
20 node from the DDB of said master node;

21 (4) updating the DDB in said master node by removing the IP address of
22 said second node from the DDB of said master node;

- 1 (5) informing said second node that said configuration no longer includes
2 said second node and detaching said second node from said configuration;
3 (6) erasing all contents of the DDB of said second node; and,
4 (7) sending an update to all remaining nodes in said configuration.
5

6 91. The method of claim 90 and wherein said update sending further comprises:
7 performing a master to node handshake between said master node and said all
8 remaining nodes in said configuration.
9

10 92. The method of claim 84, 86, 89, or 91 and wherein said master to node handshake
11 performing comprises for each one of said all other nodes in said configuration:
12 deciding if the IP address of said master node in said update matches the IP
13 address of said master node contained in the DDB of said each one of said all other nodes
14 in said configuration;
15 if no IP address match, rejecting said update and logging said event;
16 if an IP address match, deciding if the version number of the DDB in said master
17 node before said update matches the version number in the DDB of said each one of said
18 all other nodes in said configuration before said update;
19 if no version number match, accepting a completely updated DDB with updated
20 version number from said master node; and,
21 if a version number match, accepting only said update with said updated version
22 number from said master node.
23

1
2 93. In a computer network having a plurality of nodes each of which has a DDB and
3 one of which is a master node used to maintain contents of said DDB in each of said
4 plurality of nodes consistent throughout said plurality in a manner to avoid a single point
5 of failure, a system for handling failure of said master node comprising:

6 means for selecting another of said plurality of nodes as new master node if said
7 master node becomes a failed master node; and,

8 said new master node including means for advising each of said all other of said
9 plurality of nodes of identity and authority of said new master node.

10
11 94. The system of claim 93 and wherein:

12 said selecting mean includes a GUI by which a global administrator can appoint
13 said new master node.

14
15 95. The system of claim 94 and wherein said advising means comprises:

16 means for detecting failed and potentially failed nodes in said plurality of nodes;
17 and,

18 means for pinging each one of said failed and potentially failed nodes until said
19 each one of said failed and potentially failed nodes recovers into a recovered node ; and,

20 means for updating said contents of said DDB in said recovered node to match
21 said contents of said DDB of said new master node.

96. The system of claim 95 and wherein said updating means includes means for handshaking between said new master node and said recovered node.

97. The system of claim 96 and wherein said failed nodes include said failed master node and said potentially failed nodes include any other of said plurality of nodes having a failed network link to said master node.

98. In a computer network having a plurality of nodes each of which has a DDB and one of which is a master node used to maintain contents of said DDB in each of said plurality of nodes consistent throughout said plurality in a manner to avoid a single point of failure, a system for handshaking between an inquiring node of said plurality and said master node comprising:

means for obtaining the address of a first node in said plurality presumed by said inquiring node to be said inquiring node's master; and,

first means for determining from said first node if said first node is said inquiring node's master.

99. The system of claim 98 and wherein said system further comprises:

second means, responsive to operation of said first means determining that said first node is not said inquiring node's master, for inquiring of said first node who is new master for said inquiring node; and,

1 third means responsive to operation of said second means determining said new
2 master, for providing address of said new master to said inquiring node.

3
4 100. The system of claim 98 and wherein said computer network is controlled by a
5 global administrator acting through a GUI, said system further comprising:

6 fourth means, responsive to operation of said second means not determining said
7 new master, for deciding to request said global administrator to configure information
8 identifying said new master for said inquiring node; and

9 fifth means, responsive to operation of said fourth means deciding to request said
10 global administrator to configure information identifying said new master, for providing
11 such information to said inquiring node.

12
13 101. The system of claim 100 and wherein said second means includes iteration means,
14 responsive to operation of said fourth means deciding not to request said global
15 administrator to configure information identifying said new master, for causing said
16 operation of said second means to repeat.

17
18 102. The system of claim 98 and wherein said address is an IP address.

19
20
21 103. In a computer network configuration having a plurality of nodes each of which
22 has a DDB, contents of said DDB including its respective DDB version number, and one
23 of which is a master node used to maintain said contents in each of said plurality of nodes

1 consistent throughout said plurality in a manner to avoid a single point of failure, a
2 system for initiating a master to node handshake as a function of said master node
3 undertaking to provide an update message including said address of said master node to
4 all other of said plurality of nodes in response to a change to said network configuration,
5 said DDB in each of said all other of said plurality of nodes having an address of a
6 purported master node, said handshake for each of said all other of said plurality of nodes
7 comprising:

8 first means for determining if said master node address in said update message
9 matches said address of said purported master node; and,

10 second means, responsive to operation of said first means determining no match
11 for rejecting said update message.

12
13 104. The system of claim 103 and further comprising:

14 third means, responsive to operation of said first means determining a match, for
15 determining if said version number of said contents of said DDB in said node matches
16 said version number of said contents of said DDB in said master node before said update
17 message; and,

18 fourth means, responsive to operation of said third means determining no match
19 between said node DDB contents version number and said master node DDB contents
20 version number, for accepting said update message into said DDB of said node and for
21 replacing said contents of said DDB of said node with said contents of said DDB of said
22 master node.

1 105. The system of claim 104 and further comprising:

2 fifth means, responsive to operation of said third means determining a match
3 between said node DDB contents version number and said master node DDB contents
4 version number, for accepting only that portion of said update message into said DDB of
5 said node which is different from said contents of said DDB of said node.

6
7 106. The system of claim 105 and wherein said contents of said DDB of said master
8 node reflects said update message as updated contents, said portion of said update
9 message including said version number of said updated contents.

10
11 107. The system of claim 106 and wherein said version number is changed for each
12 said update message.

13
14
15 108. A computer program product for use in a computer network having a plurality of
16 nodes each of which has a DDB and one of which is a master node used to maintain
17 contents of said DDB in each of said plurality of nodes consistent throughout said
18 plurality in a manner to avoid a single point of failure, said computer program product
19 including a computer usable medium having computer readable program code thereon for
20 handling failure of said master node, said program code comprising:

21 program code for selecting another of said plurality of nodes as new master node
22 if said master node becomes a failed master node; and,

1 said new master node including program code for advising each of said all other
2 of said plurality of nodes of identity and authority of said new master node.

3
4 109. The computer program product of claim 108 and wherein:

5 said selecting mean includes a GUI by which a global administrator can appoint
6 said new master node.

7
8 110. The computer program product of claim 109 and wherein said advising program
9 code comprises:

10 program code for detecting failed and potentially failed nodes in said plurality of
11 nodes; and,

12 program code for pinging each one of said failed and potentially failed nodes until
13 said each one of said failed and potentially failed nodes recovers into a recovered node ;
14 and,

15 program code for updating said contents of said DDB in said recovered node to
16 match said contents of said DDB of said new master node.

17
18 111. The computer program product of claim 110 and wherein said updating program
19 code includes program code for handshaking between said new master node and said
20 recovered node.

112. The computer program product of claim 111 and wherein said failed nodes include said failed master node and said potentially failed nodes include any other of said plurality of nodes having a failed network link to said master node.

113. A computer program product for use in a computer network having a plurality of nodes each of which has a DDB and one of which is a master node used to maintain contents of said DDB in each of said plurality of nodes consistent throughout said plurality in a manner to avoid a single point of failure, said computer program product including a computer usable medium having computer readable program code thereon for handshaking between an inquiring node of said plurality and said master node, said program code comprising:

program code for obtaining the address of a first node in said plurality presumed by said inquiring node to be said inquiring node's master; and,
first program code for determining from said first node if said first node is said inquiring node's master.

114. The computer program product of claim 113 and wherein said computer program product further comprises:

second program code, responsive to operation of said first program code determining that said first node is not said inquiring node's master, for inquiring of said first node who is new master for said inquiring node; and,

1 third program code responsive to operation of said second program code
2 determining said new master, for providing address of said new master to said inquiring
3 node.

4
5 115. The computer program product of claim 113 and wherein said computer network
6 is controlled by a global administrator acting through a GUI, said computer program
7 product further comprising:

8 fourth program code, responsive to operation of said second program code not
9 determining said new master, for deciding to request said global administrator to
10 configure information identifying said new master for said inquiring node; and

11 fifth program code, responsive to operation of said fourth program code deciding
12 to request said global administrator to configure information identifying said new master,
13 for providing such information to said inquiring node.

14
15 116. The computer program product of claim 115 and wherein said second program
16 code includes iteration program code, responsive to operation of said fourth program
17 code deciding not to request said global administrator to configure information
18 identifying said new master, for causing said operation of said second program code to
19 repeat.

20
21 117. The computer program product of claim 113 and wherein said address is an IP
22 address.

1
2 118. A computer program product for use in a computer network configuration having
3 a plurality of nodes each of which has a DDB, contents of said DDB including its
4 respective DDB version number, and one of which is a master node used to maintain said
5 contents in each of said plurality of nodes consistent throughout said plurality in a
6 manner to avoid a single point of failure, said DDB in each of said all other of said
7 plurality of nodes having an address of a purported master node, said computer program
8 product including a computer usable medium having computer readable program code
9 thereon for handshaking initiated as a function of said master node undertaking to
10 provide an update message including address of said master node to all other of said
11 plurality of nodes in response to a change to said network configuration, said program
12 code for each of said all other of said plurality of nodes comprising:

13 first program code for determining if said master node address in said update
14 message matches said address of said purported master node;

15 second program code, responsive to operation of said first program code
16 determining no match for rejecting said update message.

17
18 119. The computer program product of claim 118 and further comprising:

19 third program code, responsive to operation of said first program code
20 determining a match, for determining if said version number of said contents of said
21 DDB in said node matches said version number of said contents of said DDB in said
22 master node before said update message; and,

1 fourth program code, responsive to operation of said third program code
2 determining no match between said node DDB contents version number and said master
3 node DDB contents version number, for accepting said update message into said DDB of
4 said node and for replacing said contents of said DDB of said node with said contents of
5 said DDB of said master node.

6
7 120. The computer program product of claim 119 and further comprising:

8 fifth program code, responsive to operation of said third program code
9 determining a match between said node DDB contents version number and said master
10 node DDB contents version number, for accepting only that portion of said update
11 message into said DDB of said node which is different from said contents of said DDB of
12 said node.

13
14 121. The computer program product of claim 120 and wherein said contents of said
15 DDB of said master node reflects said update message as updated contents, said portion
16 of said update message including said version number of said updated contents.

17
18 122. The computer program product of claim 121 and wherein said version number is
19 changed for each said update message.

20
21
22 123. In a computer network having a plurality of nodes each of which has a DDB and
23 one of which is a master node used to maintain contents of said DDB in each of said

1 plurality of nodes consistent throughout said plurality in a manner to avoid a single point
2 of failure, a method for handling failure of said master node comprising:

3 selecting another of said plurality of nodes as new master node if said master node
4 becomes a failed master node; and,

5 advising each of said all other of said plurality of nodes of identity and authority
6 of said new master node.

7
8 124. The method of claim 123 and wherein:

9 said selecting includes using a GUI by which a global administrator can appoint
10 said new master node.

11
12 125. The method of claim 124 and wherein said advising comprises:

13 detecting failed and potentially failed nodes in said plurality of nodes; and,
14 pinging each one of said failed and potentially failed nodes until said each one of
15 said failed and potentially failed nodes recovers into a recovered node ; and,

16 updating said contents of said DDB in said recovered node to match said contents
17 of said DDB of said new master node.

18
19 126. The method of claim 125 and wherein said updating includes handshaking
20 between said new master node and said recovered node.

127. The method of claim 126 and wherein said failed nodes include said failed master node and said potentially failed nodes include any other of said plurality of nodes having a failed network link to said master node.

128. In a computer network having a plurality of nodes each of which has a DDB and one of which is a master node used to maintain contents of said DDB in each of said plurality of nodes consistent throughout said plurality in a manner to avoid a single point of failure, a method for handshaking between an inquiring node of said plurality and said master node comprising:

obtaining the address of a first node in said plurality presumed by said inquiring node to be said inquiring node's master; and,
determining from said first node if said first node is said inquiring node's master.

129. The method of claim 128 and wherein said method further comprises:

if said first node is not said inquiring node's master, inquiring of said first node who is new master for said inquiring node; and,
if said new master is determined from said first node, providing address of said new master to said inquiring node.

130. The method of claim 128 and wherein said computer network is controlled by a global administrator acting through a GUI, said method further comprising:

1 if said new master is not determined from said first node, deciding whether or not
2 to request said global administrator to configure information identifying said new master
3 for said inquiring node; and

4 if said global administrator is requested to configure information identifying said
5 new master, providing such information to said inquiring node.

6
7 131. The method of claim 130 and wherein said method further comprises:

8 if said global administrator is not requested to configure information identifying
9 said new master, repeating said inquiring of said first node who is new master for said
10 inquiring node.

11
12 132. The method of claim 128 and wherein said address is an IP address.

13
14
15 133. In a computer network configuration having a plurality of nodes each of which
16 has a DDB, contents of said DDB including its respective DDB version number, and one
17 of which is a master node used to maintain said contents in each of said plurality of nodes
18 consistent throughout said plurality in a manner to avoid a single point of failure, a
19 master to node handshake method initiated as a function of said master node undertaking
20 to provide an update message including address of said master node to all other of said
21 plurality of nodes in response to a change to said network configuration, said DDB in
22 each of said all other of said plurality of nodes having an address of a purported master

node, said handshake method for each of said all other of said plurality of nodes

comprising:

determining if said master node address in said update message matches said

address of said purported master node;

if no match, rejecting said update message.

134. The method of claim 133 and further comprising:

if a match, determining if said version number of said contents of said DDB in
said node matches said version number of said contents of said DDB in said master node

before said contents of said DDB in said master node conformed to said update message;

and,

if no match between said node DDB contents version number and said master
node DDB contents version number, accepting said update message into said DDB of
said node.

135. The method of claim 134 and further comprising:

if a match between said node DDB contents version number and said master node
DDB contents version number, accepting only that portion of said update message into
said DDB of said node which is different from said contents of said DDB of said node.

136. The method of claim 135 and wherein said contents of said DDB of said master
node reflects said update message as updated contents, said portion of said update
message including said version number of said updated contents.

1
2 137. The method of claim 136 and wherein said version number is changed for each
3 said update message.
4
5

6 138. In a computer network having a plurality of nodes for interacting with computer
7 network information, apparatus for managing said plurality of nodes comprising:

8 apparatus that establishes a DDB in each of said nodes; and,
9 apparatus that controls contents of each said DDB to be substantially identical to
10 contents of every other said DDB and in a manner to avoid a single point of failure.
11
12

13 139. In a computer network having a plurality of nodes each of which has a DDB and
14 one of which is a master node used to maintain contents of said DDB in each of said
15 plurality of nodes consistent throughout said plurality in a manner to avoid a single point
16 of failure, apparatus for handling failure of said master node comprising:

17 GUI apparatus that selects another of said plurality of nodes as new master node if
18 said master node becomes a failed master node; and,

19 said new master node including apparatus that advises each of said all other of
20 said plurality of nodes of identity and authority of said new master node.
21
22

1 140. In a computer network having a plurality of nodes each of which has a DDB and
2 one of which is a master node used to maintain contents of said DDB in each of said
3 plurality of nodes consistent throughout said plurality in a manner to avoid a single point
4 of failure, handshaking apparatus utilized between an inquiring node of said plurality and
5 said master node comprising:

6 apparatus that obtains the address of a first node in said plurality presumed by
7 said inquiring node to be said inquiring node's master; and,

8 apparatus that determines from said first node if said first node is said inquiring
9 node's master.
10
11

12 141. In a computer network configuration having a plurality of nodes each of which
13 has a DDB, contents of said DDB including its respective DDB version number, and one
14 of which is a master node used to maintain said contents in each of said plurality of nodes
15 consistent throughout said plurality in a manner to avoid a single point of failure, master
16 to node handshake apparatus activated as a function of said master node undertaking to
17 provide an update message including address of said master node to all other of said
18 plurality of nodes in response to a change to said network configuration, said DDB in
19 each of said all other of said plurality of nodes having an address of a purported master
20 node, said handshake apparatus for each of said all other of said plurality of nodes
21 comprising:

22 first apparatus that determines if said master node address in said update message
23 matches said address of said purported master node; and,

1 second apparatus, responsive to operation of said first apparatus determining no
2 match that rejects said update message.

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